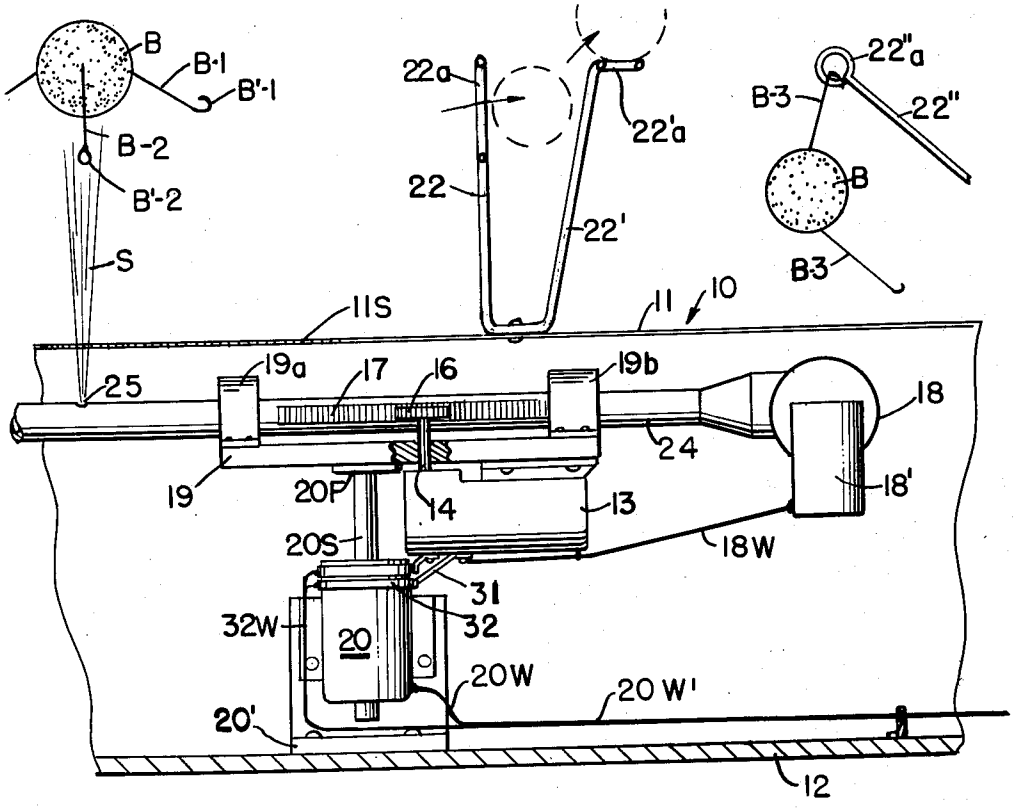
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AIR OPERATED TARGET APPARATUS

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AIR OPERATED TARGET APPARATUS

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This invention relates to target apparatus and in particular to a target game employing one or more floating targets.

In the construction of shooting ranges and the like, a stream of water directed vertically upwards has been employed as a means for floating a light plastic or cork ball near the top of said stream which is utilized as a target at which a pellet or bullet may be fired, the object being to cause said ball to fly off of the stream when disturbed by the shock wave of the bullet. The so-called Bernouli effect is utilized for causing the ball to maintain a floating position on the liquid stream, a condition which is derived by the reduction in pressure in the moving stream and the resulting atmospheric pressure which forces the ball against the stream. These pressure forces when combined with the weight of the ball act to provide a state of oscillating equilibrium whereby said ball will bobble up and down on the stream but will not separate therefrom unless disturbed by a greater force.

While such a liquid maintained target is applicable without difficulty to large scale target ranges, it is not easily adapted for smaller ranges or for use as a toy since it requires a pump, liquid reservoir and a relatively large space.

Accordingly, it is a primary object of this invention to provide a floating target apparatus which is relatively inexpensive to produce and operate.

Another object is to provide new and improved target apparatus which may utilize one or more targets which float on an air stream and hence does not require a liquid and liquid recirculating system.

Another object is to provide a new and improved target apparatus of the floating target type in which, in addition to providing means for floating a target on a vertically disposed air stream, means are provided for imposing further movement to said target.

Another object is to provide a new and improved target apparatus in which a target will float in space and will describe a horizontal as well as a vertical motion and is therefore movable through a plurality of different paths without physically touching a prime movement means such that a very realistic target is derived having a wide range of motion.

The invention also consists in certain new and original features of construction and combination of parts hereinafter set forth and claimed.

The nature of the invention, as to its objects and advantages, the mode of its operation and the manner of its organization, may be better understood by referring to the following description, taken in connection with the accompanying drawing forming a part thereof, which is a partial view of an end elevation of the target apparatus.

In the drawing, an air and electrically operated apparatus may be utilized either as a target floating means or as a game and amusement device. The apparatus illustrated may be made to both rotate and oscillate or move linearly whereby one or more vertically flowing airstreams thereof may be made to travel a plurality of paths. As a result, a light weight ball B made of cellular plastic or the like may be floated on an air stream thereof and may be controlled in its general movement around a predetermined area, the bobbing up and down motion thereof providing a source of increased amusement and interest in the device and serving as a further motion variable from which many feats of skill and games may be derived.

The apparatus shown consists of a housing 10 having side walls one of which 11 is illustrated behind which a movable air ejection means is mounted. A bracket 20', secured to the bottom 12 of the housing, mounts an electric gear-motor 20 having a shaft 20S extending vertically upward. Secured to the end of shaft 20S by means of a flange or bracket 20F is a platform or bar 19 which mounts a pair of aligned linear slide bearings 19*a* and 19*b* on the upper face thereof. An elongated tubular member 24 is adapted to be moved axially through the slide bearings and is movable along a fixed path relative to platform 19 by means of a gear-motor 13 mounted on the other side of 19, the shaft 14 of which has a sprocket or gear-tooth drive wheel 16 mounted thereon which engages a linear spur gear 17 secured to or formed in the outer face of duct 24. If all or part of the cylindrical tubular member 24 is formed by molding a plastic material such as a polyamide or other durable plastic, then the teeth or spur portion 17, which is engaged by the drive wheel 16, may be formed integral with the outer surface of said member either projecting therefrom or indented into the wall of said member by molding thereon.

Coupling between either or both of the motors 13 and 18' which operates the blower or fan of the assembly 18 and the remote source of power and controls therefor may be effected by a plurality of brush-slip ring combinations. A plurality of electrical slip rings 32 are shown insulatedly mounted on the exterior of the cylindrical housing for motor 20 which are connected to said remote controls and power supply by means of a cable 32W containing plural electrical conductors each of which extends to a respective slip ring of the group 32. The notation 18W refers to a wire pair having wires extending from the output terminals of the motor 18' to respective of the brushes 31 which ride against respective of the slip rings and maintain electrical contact between the remote power supply and said motor. The brushes 31 are shown mounted on the housing for motor 13 and may also extend from the platform 19. A single brush-slip-ring combination may be provided if a ground circuit is established between the ground of the respective motor and the shaft 20S which may be grounded or connected to the ground terminal of the power supply.

In the single embodiment, the spur gear portion 17 is preferably indented in the wall of the duct 24 so that it may pass thru the linear bearings without interference. The spur wheel 16 may also be replaced by a toothless rubber wheel or the like adapted to frictionally engage the outer surface of the tube 24 thereby eliminating the need for a spur gear or the like on 24. Secured to one end of 24 is a blower and drive motor 18 which rides back and forth therewith. The motors 13 and 20 are preferably controlled and powered from a remote position relative to the apparatus illustrated and are preferably variable in speed in accordance with the setting of a manual control means. If speed and directional controls are provided for said motors, it is noted that any point or length of the tube 24 may be made to travel any path in a horizontal plane in the area in which it may move and said path will be a function of the degree and direction(s) each of said motor shafts is rotated as well as the rotational speed thereof. Various games of skill may be derived from the apparatus including the controlled movement of the floating ball or balls thru, over, under or around obstacles to obtain an objective or the landing of the ball on fixed or movable surfaces which may be secured to or movable relative the housing 10.

A number of variations or changes may be provided in the apparatus to enhance its versatility and skill value. The housing 10 may be partly or completely covered

with a top 11S which may consist of a sheet member with either holes or slots in it. A suitable cover for the housing is a screen material having openings which will not distort the air-stream generated at the upwardly facing orifice or nozzle 25 in 24. The speed of the motor driving the ducted or centrifugal fan or pump in unit 18 may also be manually adjustable by the operator of the apparatus of the drawing so that the general height at which the ball B floats becomes another variable thereby further increasing the dimension in which the game may be played. The notations 20W', 18W and 20W refer to electrical control wires extending to and from the respective servos from a remote control panel or section of the housing 20.

Also illustrated in the drawing are a number of devices and modifications to the floating target B for enhancing the play value of the game apparatus and providing means on which a variety of different skill feats and games may be developed. It is noted that the modifications to the floating sphere and devices to be described are also applicable to any apparatus which is adapted to provide an airstream for supporting one or more light weight balls thereon.

The target B is shown with a plurality of elongated filaments or wires B–1, B–2, B–3 extending downward therefrom. These wires may be made of rigid plastic or metal and are preferably so light in weight that they do not substantially reduce the ability of the sphere B to float on said air stream. The wires preferably extend from the sphere B in a conical and symmetrical array so that they will assume essentially the attitude illustrated as the ball floats on the stream. The ends of the wires may be similarly shaped with hook portions such as B'–1 at the end of B–1 or eye portions such as B'–2 at the end of B–2 or may each have a different shape of any suitable design. In addition to serving as means for stabilizing the target ball B and to increase the target area which may be hit by a flying missile or pellet fired at the target, the wires may serve to provide a plurality of functions associated with a movable target of this type. For example, a game may be played in which the object is to manipulate the target ball B by controlled operation of the illustrated servo motors or by other means such as manual manipulation of the arm 24 or the blower 18, whereby to cause one of the wire arms to hook onto or be held by an object or surface of a device mounted off the base 10 or held by a player. To the right is shown a wire having an eye hook formed at its end with one of the hook-ends of a wire B–3 of a sphere similar to B caught on and held by the eye 22''*a* of member 22''. This could be effected by varying the speed of the motor 18' driving blower 18 and manipulating the blower or pipe 24 to cause the hook to become engaged in the eye of 22''. If the eye 22''*a* extends with its axis oblique or parallel to the horizontal as illustrated the hooked end of the ball wires may be eliminated since the object of the game may be to lower said ball with the end of a wire extending thru the eye 22''*a* until it becomes engaged and held thereby.

Also shown in the drawing is a second target for the ball B which consists of a bent piece of wire of small diameter thru or around which a spherical target may be manipulated as described to attain an objective. The wire 22 is provided with a first eye portion 22*a* thru which the ball B may be manipulated as described. The other end 22' of the form 22 is shown with an end portion 22'*a* formed in a loop or eye on which it may be desired to alight or land the ball B by manipulation of the air stream ejector. The thin wire comprising said target form offers little resistance to the generated airstream and will not disrupt its flow and prevent the floating of the ball. The wire may also be replaced by a thin sheet member, frame or stand of sheet material which extends vertically upward in the direction of the airstream having one or more holes therethrough through which the ball may be manipulated as described and one or more surface portions thereof adapted to serve as objectives on which to alight or land the ball.

In the foregoing, I have described my invention only in connection with a preferred embodiment thereof. Many variations and modifications of the principles of my invention within the scope of the description herein are obvious. Accordingly, I prefer to be bound not by the specific disclosure herein but only by the appended claims.

I claim:

1. Target apparatus comprising in combination:
(*a*) a target base including means for supporting said base on a surface,
(*b*) a fluid pressurizing system including means for guiding the fluid thereof through a duct and propelling it in a vertical direction upward from said base as a stream of air of sufficient velocity to support a target thereon in floating equilibrium,
(*c*) and automatically operating means for causing said vertical stream of fluid to be automatically rotated relative to said base whereby a target floated thereon will become retained in said stream horizontally displaced relative to said base and means for moving said base as said air stream is rotated relative thereto to define an irregular path of movement of said air stream and said target relative to said surface.

2. Target apparatus comprising in combination:
(*a*) a first base member including means for movably supporting a fluid pressurizing means thereon,
(*b*) said fluid pressurizing means including an ejector adapted to provide a stream of said fluid in a generally upward direction when operative,
(*c*) said fluid pressurizing means being mounted on a second base which is movable along a guide means in a fixed linear path,
(*d*) a reversible drive means adapted when operative to move said ejector back and forth along a linear path,
(*e*) the fluid pressurizing means adapted to provide a fluid stream of sufficient velocity and characteristic such that a light weight target may be suspended thereon in a state of dynamic equilibrium and will be maintained thereon as said stream moves back and forth with the movement of said ejector.

3. Target apparatus comprising in combination:
(*a*) a first base member including a support for a vertically extending shaft,
(*b*) a second base member supported by said shaft and adapted to rotate about the axis of said shaft,
(*c*) means for rotating said second base member relative to said first base member,
(*d*) a third base member lineally movable on said second base member,
(*e*) said third base member including a fluid ejection means and means for pressurizing said ejection means to provide a vertical stream of fluid which moves with the movement of said third base member,
(*f*) the fluid pressurizing means adapted to provide a stream of fluid of sufficient velocity to float a light weight target thereon and to maintain said target in its floating condition regardless of the movement of said third base member.

4. Game apparatus in accordance with claim 3, said members being mounted in a housing which is covered with a screen member having openings therein of such shape that the characteristic of the stream ejected upward therefrom is not substantially altered to prevent the movement and support of said target thereon, said apparatus including an objective means for said target against which said target may come to rest and be held thereby if proper manipulation of said members is effected to control the movement of said target.

5. Game apparatus comprising in combination:

(*a*) an air generating means including an ejector coupled thereto adapted to eject a stream of air vertically upward of sufficient velocity to float a light weight target thereon,

(*b*) a target adapted to be floated on said stream which consists of a light weight sphere having a hooking means projecting from its surface,

(*c*) an objective target for said sphere including means for engaging said hooking means of said sphere and for holding said sphere thereon,

(*d*) and means for manipulating said ejector in a plurality of directions relative to said objective target whereby said hooking means may be manipulated to engage and be held by said objective target.

6. Target apparatus comprising in combination with a target base, a fluid ejection duct, means secured to said base for guiding said fluid ejection duct in a predetermined lineal path, a reversible motor operated means for driving said fluid ejection duct in said path including motion first in one direction and then in a reverse direction in an oscillating movement, said duct having an orifice for ejecting a stream of fluid upwardly, and a fluid pressure generating means operatively coupled to said duct for generating sufficient fluid pressure to cause a stream of air to be ejected through said orifice at sufficient velocity to support a small light weight sphere on said stream, and a sphere floatable on said stream and retained thereby in a floating condition which sphere is movable thereon with the movement of said duct.

7. Game and amusement apparatus comprising in combination with a light weight object capable of being maintained in a floating condition on a stream of fluid, a first base member, a second base member, a fluid ejection means including means for delivering a pressurized fluid as a substantially vertical stream, capable of floating said object, said fluid ejection means being movably

mounted on said second base member, means for guiding and moving said fluid ejection means in a predetermined path relative said second base member, means for guiding and moving said second base member in a predetermined path relative said first base member whereby the movement of said fluid stream and an object floated thereon is determined at least in part by the movement of said second base member on said first base member and the movement of said fluid ejection means on said second base member.

8. Game and amusement apparatus comprising in combination with a first base member, a second base member rotationally mounted on said first base member, a fluid ejection means, said second base member including guide means for said air ejection means adapted for rotation therewith and for guiding said air ejection means in a substantially horizontal movement, means for rotating said second base member, means for moving said air ejection means along said guide means, fluid pressurizing means operatively coupled to said fluid ejection means, an upwardly disposed opening in said air ejection means for ejecting a stream of fluid in a substantially vertical direction, a light weight object adapted to ride on and be maintained in a floating condition by said stream of fluid in the air space above said base member and to be movable in a direction defined by the rotation of said second base member and the movement of said fluid ejection means along said guide means.

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